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**DISPLAY APPARATUS**Field of the Invention

The invention relates to lighted displays, and more particularly to a display that is  
5 ceiling mounted in the panel opening of a dropped panel ceiling, or other location, and has  
a changeable display unit.

Background of the Invention

U.S. Patent 4,290,218 is a replacement for a ceiling panel and uses incandescent  
lights. This patent represents a flat panel on the bottom of a ceiling unit. Retaining clips  
10 are used to attach the unit to the ceiling.

U.S. Patent 4,528,764 is a light diffuser containing several translucent drop-in  
inserts. The first or innermost insert is a translucent diffuser sheet. There has to be an  
outer sheet to sandwich the film negative against the diffuser sheet. The various  
components are of conventional acrylic. The sidewall of the unit has a cutout with a  
15 reflective and translucent baffle seated inside. It is designed to direct light downward and  
defuse light. It includes at least one inclined side in order to gain a reflection through the  
cutout for a reflective means.

U.S. Patent 5,274,938 has only a limited surface area because of its internal framing  
and limited window slots that strictly limit the amount of direct lighting on the display.  
20 The light units are mounted inside of the display.

Summary of the Invention

In accordance with a preferred embodiment, there is provided a display apparatus  
for mounting in an opening in a suspended ceiling utilizing a grid system. The display  
apparatus comprises a partially enclosed display apparatus having an open side defined by a  
25 frame, preferably corresponding in size to an opening in a ceiling grid system, and at least  
one lens attached to the frame; at least one hinge-fastener on a first side of the frame for  
securing said first side to a grid system member; and at least one fastener or latch on a  
second side of the frame, preferably opposite said first side, for releasably attaching the  
30 second side to a grid system member, wherein the at least one hinge fastener allows  
movement of the second side of the frame relative to the opening in the ceiling grid system  
while securing the display apparatus to the ceiling grid system. The display apparatus is  
preferably removably attached to the ceiling grid system, although it may be more

permanently affixed or attached to the ceiling grid system, at least in part such as by gluing, welding or the like.

Other preferred embodiments, further include one or more of the following characteristics or structures: (i) the movement of the second side of the frame relative to the opening in the ceiling grid system allows access to an interior surface of the apparatus; (ii) the at least one hinge fastener is capable of pivoting the second side of the frame relative to an opening in a ceiling grid system when the at least one hinge fastener is secured to said grid system member; and (iii) the at least one lens has a shape that is not planar with the frame.

10 In accordance with a preferred embodiment, there is provided a display apparatus for mounting in an opening in a suspended ceiling utilizing a grid system having an array of openings for mounting panels, where the display apparatus comprises a partially enclosed display apparatus having an open side corresponding in size to an opening in the ceiling grid system; at least one hinge-fastener on a first side of the display apparatus adjacent to the open side for attaching said first side to a grid system member; and at least one movable fastener on a second side of the display apparatus, opposite said first side, for releasably attaching the second side to a grid system member.

15 In accordance with another preferred embodiment, there is provided a display apparatus for mounting in an opening in a suspended ceiling utilizing a grid system, where the grid system has an array of openings for mounting panels. The display apparatus comprises a partially enclosed display apparatus having an open side corresponding in size to an opening in the ceiling grid system; at least one hinge-fastener on a first side of the display apparatus adjacent to the open side for attaching said first side to a grid system member; at least one movable fastener on a second side of the display apparatus, opposite said first side, for releasably attaching the second side to a grid system member; and a removable display unit insertable into and removable from the display apparatus which displays writing and/or graphics.

20 In accordance with a preferred embodiment, there is provided a display apparatus comprising a light fixture, a partially enclosed display apparatus having an open side corresponding in size to an opening in a ceiling grid system, a mounting rim for mounting the display apparatus in the light fixture; and a removable display graphic for inserting into and removing from the display apparatus replacing information and advertisements. The

open side of the display apparatus is preferably connected (preferably removably) to the light fixture.

In accordance with a preferred embodiment, there is provided a method for displaying information and/or graphics. The method comprises optionally installing a display apparatus according to one of the embodiments described herein; unfastening one or more fasteners or latches of the apparatus; pivoting the frame downward, thereby exposing the interior or open side of the apparatus and placing the apparatus in an open or partially open configuration; removing and/or replacing one or more display units into the interior of the apparatus, the one or more display units including information and/or graphics; pivoting the frame upward; and fastening the one or more moveable fasteners or latches.

In accordance with one preferred embodiment there is provided a back illuminated ceiling mounted display apparatus that attaches to the framework of ceiling panel opening in which it is mounted. The display apparatus attaches to the panel ceiling framework, and covers at least a portion of at least one ceiling fluorescent light box which is generally mounted on the ceiling above the framework grid. The display apparatus may also be attached to other surfaces, especially lighted surfaces, including, but not limited to, walls, chairs, aircraft wire and other places where information/advertising is desired.

A preferred attachment mechanism comprises at least one strip or hinge-fastener on one side that attaches one side of the display apparatus frame to the ceiling grid. The opposite side of the display apparatus frame is preferably secured to the grid frame, grid system, and or framework of the suspended ceiling by at least one clip, preferably a movable clip. Alternatively, more than one side, or even all sides, may be attached by one or more clips.

In one embodiment, a foldable removable display unit is inserted into the display apparatus to provide information, advertisements, or other verbal and/or graphical display.

#### Brief Description of the Drawings

FIG. 1 shows a dropped panel ceiling with a ceiling mounted display apparatus, according to a preferred embodiment, mounted in one panel space;

FIG. 2 shows an unmounted display apparatus according to a preferred embodiment; FIG. 3 shows a cross-section of a preferred display apparatus as it is being mounted;

FIG. 4 shows a preferred embodiment of a latch for securing the display apparatus to a ceiling frame;

FIG. 5 shows an end partial cross-sectional view of a preferred mounted display apparatus;

FIG. 6 shows a preferred foldable graphic insert for a display apparatus having a shape similar to that in Figure 1;

5 FIG. 7 shows a partial folded view of the insert of FIG. 6;

FIG. 8 is an end view of the insert of FIG. 6;

FIG. 9 shows the folded advertisement insert of FIG. 6;

FIG. 10 shows one of two optional end brackets;

FIG. 10a shows a cross-sectional view of the end bracket;

10 FIG. 11 shows a side view of a preferred embodiment of an illuminated display apparatus;

FIG. 12 is an end view of the embodiment of FIG. 11;

FIG. 13 shows one embodiment of graphic insert for use in a display apparatus;

15 FIG. 14 is an isometric view of the display holder/mount of the display apparatus of FIG. 11;

FIG. 15 is a side view of the display holder/mount of FIG. 14

FIG. 16 shows the graphic panel parts of FIG. 13 as it is inserted into the display/holder of FIG. 14; and

20 FIG. 17 shows a display apparatus with the graphic panel parts, and an insert graphic "pinch" that holds the graphic panel parts in place.

#### Detailed Description of the Preferred Embodiment

FIG. 1 shows a display apparatus 20 mounted in an opening 22 in a dropped ceiling. The dropped ceiling includes a grid frame 21, and panels 23 mounted in the grid frame. A panel 23 is removed and display apparatus is mounted in the opening. In alternate 25 embodiments, a display apparatus may cover more than one panel opening or less than one panel opening. It is preferred, however, that the apparatus cover one or more entire panel openings.

FIG. 2 is an isometric view of a preferred embodiment of display apparatus 20 with a frame 24 on all sides of the lens framing the opening 19. There is preferably at least one 30 hinge-fastener on at least one side of the frame and at least one latch on at least one side of the frame. Preferably the hinge-fastener(s) and latch(es) are on opposing sides. In the illustrated embodiment, there are two individual hinge-fasteners 25 and 26 on one side, and

at two latches 28 and 29 on the side opposite the side on which the hinge-fasteners 25 and 26 are mounted. In alternate embodiments, there may be one, three, four or more hinge-fasteners and/or one, three, four or more than two latches. For example, in one embodiment, there is one hinge-fastener that extends at least partially along the length of 5 one side of display apparatus 20.

Hinge-fasteners 25 and 26 are preferably secured to a part of the grid frame 21 by placing a part of each hinge-fastener 25 and 26 over the frame. The opposite side is then secured to frame 21 by the latches 28 and 29. Display unit may be placed in a grid frame opening below a light to provide back illumination for display apparatus 20.

Once installed and secured to the frame 21, the apparatus may be opened and closed repeatedly to access the interior of the apparatus and the ceiling portion covered by the apparatus for servicing (e.g. changing a graphic panel or insert, cleaning or inspecting the apparatus or a light element, etc.). The position of the display apparatus in FIG. 3 depicts the apparatus in a partially open configuration, such as during mounting in grid frame 21 or 10 during opening or closing of the apparatus. The one or more hinge-fasteners are capable of supporting the apparatus following release of the one or more latches, which permits the lens to pivot on the hinge-fasteners, thereby providing access to the interior surfaces of the lens and any lights mounted in the ceiling which are covered by the apparatus when it is in 15 the closed configuration (see FIG. 5). In this manner the apparatus remains attached to the grid frame 21 during servicing. Because the apparatus is mounted on a ceiling, one servicing the apparatus commonly accesses the device by standing on a ladder. The ability 20 of the apparatus to remain secured to the grid frame during servicing frees the serviceperson from having to hold or support the apparatus while standing on a ladder, and is therefore much safer to use than apparatuses which require the removal and/or manual support of the 25 apparatus during servicing.

FIG. 3 shows one embodiment of display apparatus. Frame 21 is made up of a grid of T-shaped members. Each of hinge-fasteners 25 and 26 are hooked over the upward part 21a of grid member 21. As illustrated, hinge-fastener part 26a is generally U-shaped and is placed over part 21a. Shapes other than U-shape may be used, provided that the part covers 30 at least part of both sides of part 21a and extends over the top of part 21a. Part 26a may be unitary with part 26b, or they may be separate pieces with part 26a being secured to part 26b by a suitable fastener or fastening means, including but not limited to a bolt and nut,

clamp, screw and nut, rivet, weld, ratchet mechanism, the illustrated screw 26f and wing nut 26e, or other suitable fastener. In some embodiments, part 26a is slidably adjustable on part 26b before fastening the parts together such as by the illustrated nut 26f being tightened on nut 26f. This adjustable feature allows an adjustment depending upon the size 5 (height) of the grid part 21a. Part 26b is attached to part 26d by hinge 26c and to the frame 24 of the display apparatus.

In alternate embodiments, a hinge fastener may omit part 26a and part of 26b and be configured to fit over all or some of part 21b of the grid member, optionally extending along some or all of part 21a of grid member 21. In one embodiment, part 26a is omitted 10 and part 26b extends over at least some of part 21b and then bends to extend back over and beyond hinge portion 26c.

During installation, after the one or more hinge-fasteners 25 and 26 are secured to grid frame 21, the display apparatus 20 is pivoted upward and one or more latches 28 and 29 are engaged to secure the frame 24 to the bottom part of the grid part 21b. In the 15 illustrated embodiment, the latches are pivoted outward to allow frame 24 to be positioned against the bottom side of grid part 21b, and then pivoted back against frame 24, with a portion of the latch being positioned over grid part 21b, holding display apparatus in position. Latches other than those illustrated may be used, including those which pivot upwards or downwards instead of outwards and inwards as in the illustrated embodiment.

20 FIG. 4 shows latch 28 pivoted outward to allow grid part 21b and frame 24 to come adjacent to each other. Latch 28 preferably has a portion 28b that extends under frame 24 and is attached thereto by a suitable mechanism as is known in the art, such as a pin or flexible member to allow latch 28 to pivot away to allow frame 24 and grid part 21b to come together as display apparatus 20 is moved upward. The latch 28 is pivoted inward to 25 secure frame 24 to grid part 21b.

FIG. 5 is an end view showing display apparatus in a mounted position, held in place by hinge-fastener 26 (and 25) and latch 28. The illustrated latch 28 has a movable pin 28a that is used to secure latch 28 in a fastened or engaged position. Alternate methods of securing, such as are known in the art, may also be used, including but not limited to, a 30 screw, clamp, ratchet, lock or other suitable mechanism.

Display apparatus 20 may have four sides or lens portions 30, 31, 32 and 33, as illustrated, but may have more sides or fewer sides in alternate embodiments. The term

lens, as used herein, is another name for a side and does not imply any particular construction or optical properties. The display apparatus may also take almost any shape, including, but not limited to the shape of a cube, a pyramid, a cylinder, a cone, or more complex shapes. The sides may also be fully solid as illustrated, or they may be only 5 partially solid, for example, having a gap at the top of one or more sides to allow air circulation and heat dissipation from a fixture. The sides may comprise smooth or textured surfaces; they may comprise flat sides or louvered sides or otherwise having more than one plane on each side; they may comprise a material having a continuous surface such as a pane of glass or an extruded polymeric film or they may comprise a mesh, wire or other 10 discontinuous surfaced material. The sides or lens portions may comprise any suitable material such as glass, plastics, metals, and combinations thereof. The frame 24 preferably comprises metal and/or plastic, but may also comprise wood, composites, and other materials.

Each side may have display information or advertisements in verbal and/or 15 graphical form. In one embodiment, to render display apparatus more flexible in use, one or more sides are be clear or transparent (including comprising a mesh which does not substantially obscure the text and/or graphics) with a removable or changeable display unit being placed inside of display apparatus 20. Alternatively, the information and/or advertisements may be applied directly to one or more sides and ends of the apparatus. 20 FIG. 6 shows one embodiment of a flat display unit that may be folded for inserting inside of display apparatus 20 of a shape as is illustrated in FIG. 1. By providing a flat display unit, it is easier to print information thereon and then fold the display unit. Display unit 40 may have, for example four sides or lens portions 41, 42, 43, and 44. Printing may be placed on one or more of the sides in any combination. The display unit is preferably made 25 of a material which allows some passage of light so as to allow the message or display to be illuminated by having light pass through the display and then through the one or more sides.

FIG. 7 shows a display unit 40 of FIG. 6 in a partially folded position. Sides 41 and 42 have been folded upward to form a V-shape structure, and ends 43 and 44 are folded to enclose the open ends of sides 41 and 42 after folding. FIG. 8 shows an end view of 30 display unit after the sides and ends have been folded.

FIG. 9 is an isometric view of folded display unit 40 as in FIG. 6. To hold the edges of the sides 41 and 42 and ends 43 and 44 together, a V-shaped guide/fastener (FIG. 10) is

used to hold the ends together and to cover the ends when the display unit 40 is placed into display apparatus 20. A cross sectional view of guide 50 is shown in FIG. 10a, with a side and end of display unit shown with dashed lines. By having a removal display unit 40, information displays and advertisements may be changed in display apparatus 20 by simple 5 changing out the display unit 40.

In accordance with one embodiment, there is provided a method for displaying information and/or graphics, comprising installing a display apparatus according to embodiments described herein, disengaging (unfastening) the one or more latches (including by unhooking, pivoting, moving a pin or screw, unlocking, and the like), and 10 pivoting the frame downward, thereby exposing the open side and thus the interior of the display apparatus. Once the apparatus is in this open or partially open configuration, one or more display units, preferably of the type in FIG. 6 – FIG. 9 or FIG. 13, containing information and/or graphics may be removed and/or placed into the apparatus. The apparatus is then pivoted upward and the one or more latches are engaged or fastened, 15 thereby securing the apparatus in the closed configuration. The method may be performed without disengaging the one or more hinge fasteners from the grid member. Furthermore, in preferred embodiments, the apparatus is self-supporting in the open configuration and it may remain in the open configuration for the several minutes (indefinitely in some embodiments) that it may take to service the apparatus without the apparatus coming 20 unsecured or falling from the ceiling.

The guide/fastener 50, or modifications thereof, shown in FIGS. 10 and 10a, may be used to hold multiple graphics such as that illustrated in FIGS. 7 and 13 to present lenticular displays. With such multiple graphics you can have a range of graphical effects can be created that are not mutually exclusive. For example, you can have a 3D piece with 25 elements that flip, morph, zoom and/or have motion. These elements cause variation in the display such as: (1) 3D-The optical illusion of depth and distance between elements from the foreground to the background; (2) Flip-The quick transition between distinct graphical elements. In many cases, flip images can be improved with subtle incorporation of morphing; (3) Morph-A fluid transition between graphical elements, usually of like size and 30 shape; (4) Zoom-Image moves front to back graining or decreasing in size; and (5) Motion-The re-creation of a motion event from video or series of stills. Other suitable

apparatus for providing the foregoing graphical effects which can be mounted in a display apparatus include those known in the art.

FIG. 11 is a side view of a display device 60 that may be ceiling mounted or wall mounted. Display device 60 includes a display holder 61 that is mounted in a light box 62 utilizing a mounting rim 64. Light box 62 includes one or more lights 63. Display 60 may be mounted on the grid of a dropped ceiling as shown in FIG. 1, mounted on a non-dropped ceiling, or mounted on a wall or other mounting device, including but not limited to, chairs, aircraft wires and other areas where information/advertising is desired. The sides and frame may comprise the materials and characteristics as described above with regard to other 10 embodiments.

FIG. 12 is an end view of display device 60 showing display holder 61 and four lights 63.

FIG. 13 shows the parts of a graphic display 70 that may be inserted into display holder 61 or 20. Graphic display 70 includes side panels 71 and 72 to provide information displays for the sides of display device 60. Two end pieces 74 and 75 may be used for additional information displays at the ends of display device 60.

FIG. 14 is an isometric view of the display holder 61 and FIG. 15 is a side view. These two views show sides 65 and 66, and the ends 67 and 68. The graphic display 70 is inserted into display holder 71 so that graphic display holder sides 71 and 72 are mounted adjacent, respectfully, to sides 65 and 66, and graphic display ends 74 and 75 are mounted, respectfully, to ends 67 and 68 of display holder 61. By utilizing the graphic display 70, advertisements and information displays may be changed periodically as needed. Alternatively, the information and/or advertisements may be applied directly to the sides 65 and 66 and ends 67 and 68 of display holder 61. FIG. 16 shows the parts of graphic 25 display 70 as they are inserted into display holder 61.

FIG 17 is an exploded view of the graphic display apparatus showing the display holder 61, the graphic display 70 and a "pinch" device 78 that holds the graphic display parts 70 in place. The pinch 78 has a slightly smaller dimension than the insider of display apparatus 61 after graphics 70 is inserted. Pinch 78 may be opaque or transparent and of 30 various colors to provide a background for the graphics on graphic display 70.